

# CENTER FOR THE INTEGRATION OF HYDROMETEOROLOGICAL ACTIVITIES IN CENTRAL AMERICA



**PREPARED FOR:**  
**U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT**

**PREPARED BY:**  
**U.S. DEPARTMENT OF COMMERCE**  
**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**  
**AND**  
**COMITE REGIONAL DE RECURSOS HIDRAULICOS**  
**DEL ISTMO CENTROAMERICANO**

**UNDER THE**  
**U.S. DEPARTMENT OF COMMERCE**  
**HURRICANE RECONSTRUCTION PROGRAM**

**May 2001**



# Chapter I

## Introduction

*The Central America National Meteorological and Hydrologic Services provide critical data and information during severe weather and flooding events in the Region. The development of a Central America Regional Center for Integration of Hydrometeorological Activities would be part of a Strategic Framework for Disaster Reduction that includes improvement of early warning systems.*

# Introduction

## Document Purpose

The purpose of this document is to present a concept of a framework for a regional center for hydrometeorological activities in Central America. This document provides an overview of the center, its functions and mission and an estimate of initialization and operational costs. Preparation of this document is a defined activity by the National Oceanic and Atmospheric Administration (NOAA) under the U.S. Department of Commerce Hurricane Reconstruction Program, funded by the U.S. Agency for International Development (USAID).

The framework presented herein is based on research by the *Comité Regional de Recursos Hidraulicos del Istmo Centroamericano* (CRRH) on the needs for regional support to the meteorological and hydrologic services in Central America. The proposed framework discussed in this document is for a fully operational center. It is understood that, contingent on funding and the political environment, that implementation may only be realized over a period of several years or longer. What is described is a center that can most benefit the Region based on the current condition of the meteorological and hydrologic services.

## Center Concept

The idea of a regional center for hydrometeorological activities was raised during evaluations of needs to transform and strengthen the national meteorological and hydrological services (NMHSs) in the region following Hurricane Mitch in October-November 1998. The National Oceanic and Atmospheric Administration (NOAA) performed these evaluations as part of the Hurricane Reconstruction Program. What was found was a need for the NMHSs to provide more operational services, especially in the area of early warnings for severe weather-related events such as flooding.

Consequently, the NOAA/NWS Hurricane Reconstruction activities in Central America focused on strengthening the early warning capabilities of each of the Hurricane Mitch affected countries – Honduras, Nicaragua, Guatemala, and El Salvador. NOAA/NWS is in the process of providing hardware, software, and training for programs such as river forecasting systems, flash flood guidance and warning systems, enhanced satellite capabilities, and climate outlook capabilities.

Though the idea of a regional center had been proposed in the past – the need for a centralized and integrated approach for continued strengthening of these agencies was most evident after the hurricane. Due to restrictions on financial and personnel resources continued transformation and strengthening by individual country is difficult – as is sustaining existing meteorological and hydrologic programs. Therefore, a regional

center, which can act as a focal point for supporting and coordinating the meteorological and hydrologic services and efficiently enhancing their capabilities, is proposed. The goal is to build solid national meteorological and hydrologic services with well thought out and sustainable programs and then enhance their technical capabilities through a central, regional facility that supports each service.

The development of a Central America Regional Center for Integration of Hydrometeorological Activities would be part of a **Strategic Framework for Disaster Reduction** that includes improvement of early warning systems.



## Chapter II

# Regional Needs

*The Central America National Meteorological and Hydrologic Services collect important data needed to support commercial, military and private aviation interests.*

## Regional Needs

Extreme weather-related events such as floods and droughts by far cause the most fatalities and property damage in the region when compared to other extreme natural events. Because of this strong, reliable meteorological and hydrologic services that can provide accurate forecasts and outlooks is necessary. These services must be in position to provide reliable and timely products to a variety of users and stakeholders, both public and private. However, there is a general perception in the region that weather and climate information for users and decision-makers is unavailable or inadequate. For example, comments on the availability of long term climate information in a usable form ranges from ‘medium’ at best to ‘low’ dependent on the type of information needed.

In general, the current demands for data and information from the public and private sector versus the current services being provided can be summarized in the following table.

### NMHS Primary Service Requirements

<i>Requested Product or Service</i>	<i>Responsible Agency</i>	<i>Product or Service Currently Provided</i>	<i>Comments</i>
<i>Nowcasts/current weather information</i>	NMHS	Limited	NOAA Hurricane Reconstruction Program will provide additional capacity
<i>Short-term (1-3 day) weather forecasts</i>	NMHS	Available but limited distribution	
<i>Medium-range (3-5 day) weather forecasts</i>	NMHS	Not done	
<i>Seasonal/annual Climate Outlooks</i>	NMHS	Limited	NOAA Hurricane Reconstruction Program will provide additional capacity
<i>Hydrologic Forecasts (e.g., floods, droughts), including Flood Early Warning</i>	NMHS	Not done	NOAA Hurricane Reconstruction Program will provide additional capacity
<i>Quantitative Precipitation Forecasts</i>	NMHS	Not done	Limited applicable models available

Even for those areas where the NOAA Hurricane Reconstruction Program will provide additional capacity, there are concerns regarding sustainability of the service under the current NMHS systems and conditions.

In most countries in the region, the services responsible for the production or dissemination of weather and climate data or information are weak due to insufficient budgets, lack of qualified personnel, shortages of technical or administrative support, lack of basic equipment, inappropriate allocation of existing resources, and poor planning. The main reasons for the incomplete development or distribution of the products and services noted in the above table include the following specific issues:

- Poor regional exchange of data and information
- Technological limitations to access information from global or regional centers
- Deficient data digitization and archiving and data management
- Deficient observation networks (including communications) with inadequate maintenance capabilities (Note that the NOAA Hurricane Reconstruction Program will provide additional capabilities and capacity however there are concerns regarding sustainability under the current NMHS systems and conditions)
- Inadequate personnel resources (technical capabilities and number of personnel) and technical resources (obstacles for the procurement of new or replacement equipment)
- Ineffective management of data and information during emergencies, use of inappropriate information by unauthorized or unqualified sources
- Low priority given to the NMHSs by the upper levels of government, minimal budget interaction by the NMHSs
- NMHS institutional vision and/or mission undefined or unclear
- Improved technology is seen as the only way to improve existing capabilities, refusal to change techniques or structures to improve, limited ability or desire to change from the traditional approaches

Strong, technically competent and coordinated NMHSs are needed throughout the region in order to continue to provide or to begin to provide the services necessary to build economies and to help save lives and properties. It was evident after Hurricane Mitch that the operational capabilities of each NMHS need to be strengthened so these services can be provided accurately and timely. In order to continue to improve the capabilities of the NMHSs throughout the region in an efficient and economic manner, a regional center for hydrometeorological activities is proposed.





## Chapter III Regional Center Description

*Installation and maintenance of monitoring equipment is an important function of the Central America National Meteorological and Hydrologic Services.*

# Regional Center Description

## Name and Mission

The name of the center is *The Center for the Integration of Meteorological and Hydrologic Activities in the Central American Isthmus (CIMH)*.

The mission of CIMH is to –

*Strengthen and coordinate Central American regional capacities and capabilities in the areas of weather, climate, and hydrological data analysis and forecast by integrating efforts and activities of national meteorological and hydrological services, universities and research centers. The CIMH will provide information, data analysis, products and new services development, training programs and maintenance support at a level that complements national activities and benefits individual countries.*

The most important functions of the center will be to 1) *integrate* the national meteorological and hydrologic services to avoid a fragmented approach to improving the capacity and capabilities of these services in the region, 2) *coordinate* operational activities amongst the national services especially with regards to early warning and disaster management, 3) enhance the sustainability of key programs in the region, and 4) provide a link to international organizations (public and private) and institutions outside of Central America to further enhance hydrometeorological capabilities.

## Functional Overview

Once completely functional, the CIMH will be a completely operational unit with permanently assigned staff. The CIMH will be located in Costa Rica. It will not operate independently of the national NMHSs but rather will operate in conjunction with them to supplement and coordinate their capabilities. In implementing the CIMH, it will be important to evaluate which services and combinations of services can be done more efficiently at the national level and which can be done more efficiently at the regional level.

Once fully functional, the CIMH will coordinate, perform or facilitate the types of technical services shown in the following table either directly or in conjunction with the national services.

## CIMH Services

<i>Service Area</i>	<i>Services</i>
<i>Weather/Meteorology</i>	<ul style="list-style-type: none"> <li>• Continually monitor the weather which impacts the Central America region</li> <li>• Gather, process, and evaluate surface and upper air observations including remote-sensed data such as from radar and satellite</li> <li>• Execute and disseminate results from mesoscale forecast models validated for Central America</li> <li>• Provide national NMHSs with analysis and interpretation of data and model outputs</li> <li>• Facilitate daily (or as needed) weather forecast discussions between the CIMH and NMHSs</li> </ul>
<i>Climate</i>	<ul style="list-style-type: none"> <li>• Continually monitor the climate in the Central America region</li> <li>• Develop and maintain data bases of appropriate hydrometeorological data</li> <li>• Execute and disseminate results from climate outlook models validated and appropriately scaled for Central America</li> <li>• Coordinate climate outlook fora in order to provide consensus seasonal outlooks</li> </ul>
<i>Hydrology</i>	<ul style="list-style-type: none"> <li>• Continually monitor events which impact the hydrologic conditions in the Central America</li> <li>• Facilitate daily hydrologic outlook discussions (in conjunction with daily weather discussions)</li> <li>• Gather and process hydrologic data from throughout the region</li> <li>• Provide backup hydrologic forecasts for key river basins that are being forecasted by the NMHSs.</li> <li>• Provide regional flash flood guidance capability</li> </ul>

## CIMH Services

<i>Service Area</i>	<i>Services</i>
<b><i>Marine</i></b>	<ul style="list-style-type: none"> <li>• Gather and process observations and other marine information</li> <li>• Provide marine weather forecasts</li> </ul>
<b><i>Fires</i></b>	<ul style="list-style-type: none"> <li>• Coordinate fire detection capability</li> </ul>
<b><i>Disaster Management/Early Warning</i></b>	<ul style="list-style-type: none"> <li>• Provide a regional weather ‘threats assessment’ product – early alerts and warnings for extreme events likely to affect the region</li> <li>• Coordinate regional activities during extreme weather events</li> <li>• Coordinate risk assessments and mapping and vulnerability assessments</li> </ul>
<b><i>Hydrometeorological Monitoring Program Maintenance</i></b>	<ul style="list-style-type: none"> <li>• Provide a regional hardware and software maintenance service center</li> </ul>
<b><i>General Integration Activities</i></b>	<ul style="list-style-type: none"> <li>• Integrate meteorological and hydrologic activities</li> <li>• Coordinate training programs for operational personnel of NMHSs from the Region</li> <li>• Seek opportunities to develop applications of forecast, weather and climate information to particular users or sectors – coordinate regional marketing activities with the NMHSs</li> <li>• Coordinate expansion and improvement of capabilities with NMHSs</li> <li>• Identify resources within each NMHSs that can be shared</li> <li>• Coordinate communications between all NMHSs via Internet including dissemination of data, information, and products</li> <li>• Coordinate public education, awareness, and training programs</li> <li>• Coordinate CIMH and NMHS strategic planning including budgeting and revenue generation</li> <li>• Coordinate international donors</li> <li>• Manage regional data bases</li> </ul>

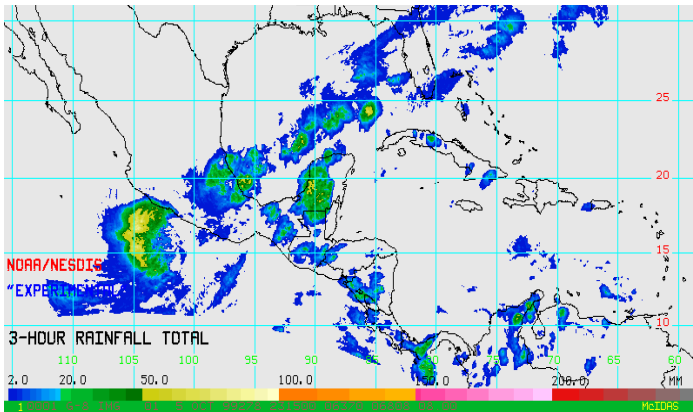
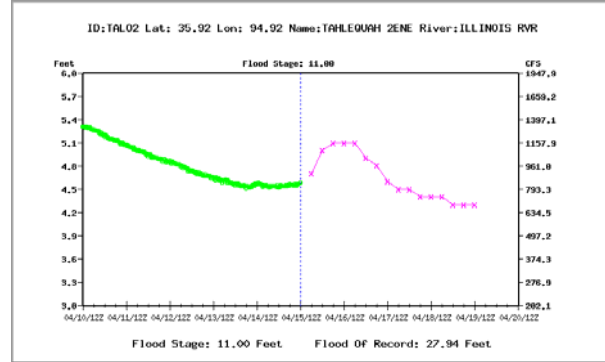
The priority of these services and the order and manner in which they are implemented, will be addressed in more detail in an implementation plan for the CIMH. The implementation plan would be a separate document prepared by CRRH and the NMHSs.

Two key services mentioned above include the operation of a regional hardware and software maintenance support center and becoming a backup for the river and flood forecasting for important river basins in the region.

The CIMH will support the NMHSs with the maintenance of field hydrometeorological measurement equipment. The primary responsibility for sustaining this equipment rests with the national services. The Regional Maintenance Service Center within the CIMH will provide assistance in the maintenance of this equipment. The Service Center will perform the following functions.

- Daily customer service for installed hardware and software systems
- Quarterly visits to each country to review maintenance programs and assist with maintenance issues, as required
- Operate an equipment repair and calibration center
- Operate a training center for system hardware and software operations
- Operate a spare parts depot

As part of the NOAA Hurricane Reconstruction Program funded by USAID, hydrologic forecasting systems were installed for several key river basins within the region. One of these basins was transnational, being located in three countries. These systems are used for flood forecasts and, in some countries, reservoir and water resources management. The CIMH will have backup hydrologic forecast systems in the event that the primary systems located in the host countries are not available due to some major failure in hardware or software or power failure. Environmental data to drive the CIMH systems will be obtained via satellite telemetry in the same manner as is done in the host countries.



## Chapter IV

### Users and NMHS

### Coordination

*The NOAA Hurricane Reconstruction Program, funded by USAID, will provide enhanced meteorological and hydrologic capabilities to the Region, especially for early warnings of extreme events – but this increased capacity must be sustained.*

# Users and NMHS Coordination

## Users

The demand for hydrometeorological information and data applicable to decision-making varies by sector and, in some cases, the need is recognized but the direct application and benefits have not been evaluated and quantified. However, the proper application of hydrometeorological data can have a marked economic impact and save lives. The type of products required and schedule for delivery can also vary, sometimes placing an undo burden on national services with limited resources to develop and disseminate quality products in a timely manner. The CIMH can be used to fill the void, thus allowing the NMHSs to expand their user base.

A strong stakeholder/user base is required for transforming and strengthening the NMHSs and in developing and sustaining the CIMH.

Based on research in the region, the following represent a sample of potential users of products generated at the regional and national levels.

- Risk/disaster managers (public and private) require more and higher quality information about spatial distributions and intensity for extreme rainfall events, flood/flash flood forecasts, mudslide potential, estimated duration and intensity of wet and dry seasons, drought development and duration, El Niño development and intensity, wild fire detection, length of daylight, storm surge or tsunami occurrence, and marine weather and sea state conditions.
- Agriculture managers have expressed a keen interest in regional products including spatial and temporal distributions of rainfall, seasonal rainfall forecasts, weather and climate information relative to crop yield or field operations, climatological analyses and studies, data and forecasts of winds, temperature, hours of sunshine, and early warnings of extreme weather or climate conditions.
- Water managers require seasonal rainfall forecasts, spatial and temporal distributions of rainfall, reservoir inflow, and flood potential.
- The transportation and building sectors require information on extreme climate conditions and flood and mudslide vulnerability assessments especially areas with high flood potential and potential for disruption of transit services.
- The tourist sector would require information on onset and duration of the dry and wet seasons, current and forecast streamflow conditions, flash flood potential, and daily weather forecasts for areas frequented by tourists (e.g., beaches, rivers, reservoirs, mountains).



- The health sector would have use for climate information and advance warnings for severe weather events such as flooding.
- The CIMH would provide needed expertise and data to evaluate environmental impacts in the air and water from various anthropogenic activities.

Historically, the NMHSs have not proactively marketed these potential users of their services. The CIMH, working with the NMHSs, will develop and market products needed by these sectors, focusing first on those sectors with the greatest need and demand and on the populations and economic sectors at risk. Some users will become clients of both the national services and the CIMH, depending on needs.

During research for the CIMH, CRRH had workshops in Nicaragua, Guatemala, Honduras, and Costa Rica to discuss the objectives of the CIMH. During the workshops, surveys were taken asking the opinion of the NMHSs and potential users on the potential benefits of the center to populations at risk and the economy. The results are provided in the Appendix to this document.

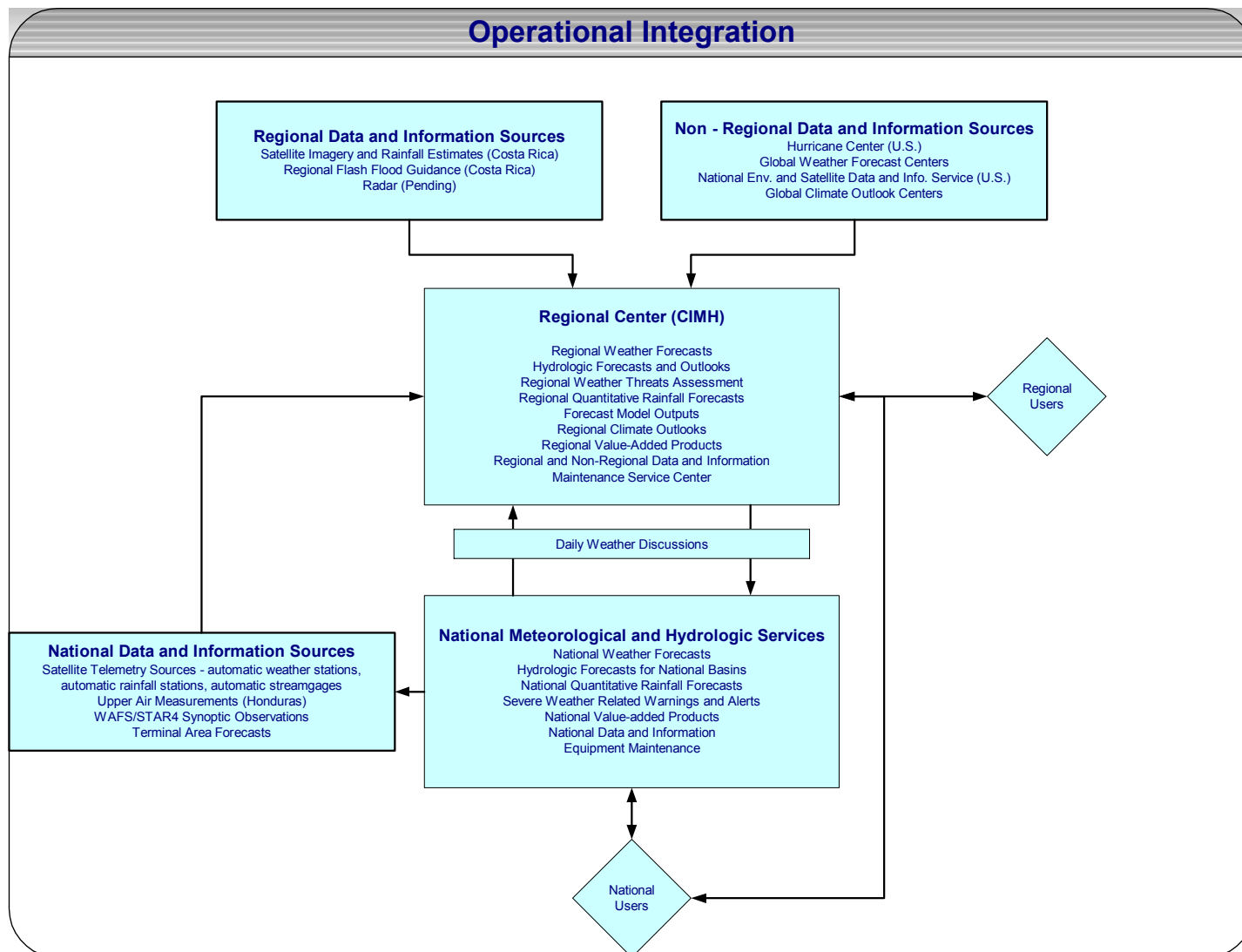
### **NMHS Coordination**

If politically feasible, the CIMH can be considered an extension of the NMHSs, providing capabilities and coordination in areas where national-based resources are inadequate. The CIMH will facilitate the sharing of resources throughout the region. The CIMH will also work closely with the NMHSs to interact with the user community throughout the region. Cooperative Agreements between the CIMH and the NMHSs will need to be developed, especially with countries sharing resources and the host country – Costa Rica.

The NMHSs will provide the national data and information needed for the operation of the CIMH. The CIMH will provide regional data and information (e.g., satellite imagery, flash flood guidance, composite radar imagery – once available) and specified products to the NMHSs. Due to existing resource issues within the countries in the Region, it is not planned to require operations personnel from the NMHSs be assigned to the CIMH. Countries may voluntarily assign personnel however and each country will have input as to the CIMH operations (see **Organization**).

The operational interrelationships between the CIMH and the NMHSs are shown in the following figure.







## Chapter V Staffing and Organization

*Satellite telemetry of data and the Internet will be the key for communications of hydrometeorological data and information throughout the Region.*

# Staffing and Organization

## Center Staffing

Once the CIMH is fully operational, a staff of approximately 35 persons will be required to maintain operations 24 hours per day, seven days per week. If the center is collocated with the NMHS in the host country (proposed to be Costa Rica) then some sharing of staff can be done. Personnel assignments to the CIMH from the non-host countries would be limited to short duration training exercises due to the already depleted staffs at the NMHSs. However, the NMHS staffs will work closely with the CIMH staff during day-to-day operations. The staff requirements are anticipated to be as follows:

### Professional Staff

- Director – 1
- Meteorologists – 4 (one per shift, four shifts)
- Hydrologists – 4 (one per shift, four shifts)
- Hydrometeorologists – 4 (one per shift, four shifts)
- Hydrology/meteorology specialists (e.g., climate, modeling, statistics) – 4
- Systems software engineer (maintenance service center) – 1
- Electrical engineer (maintenance service center) – 1

### Technical Staff

- Hydrology/meteorology technicians – 12 (two per shift, four shifts plus four specialists in data analysis, data base management)
- Electronic technician (maintenance service center) – 1
- Network administrator, computer specialist - 1

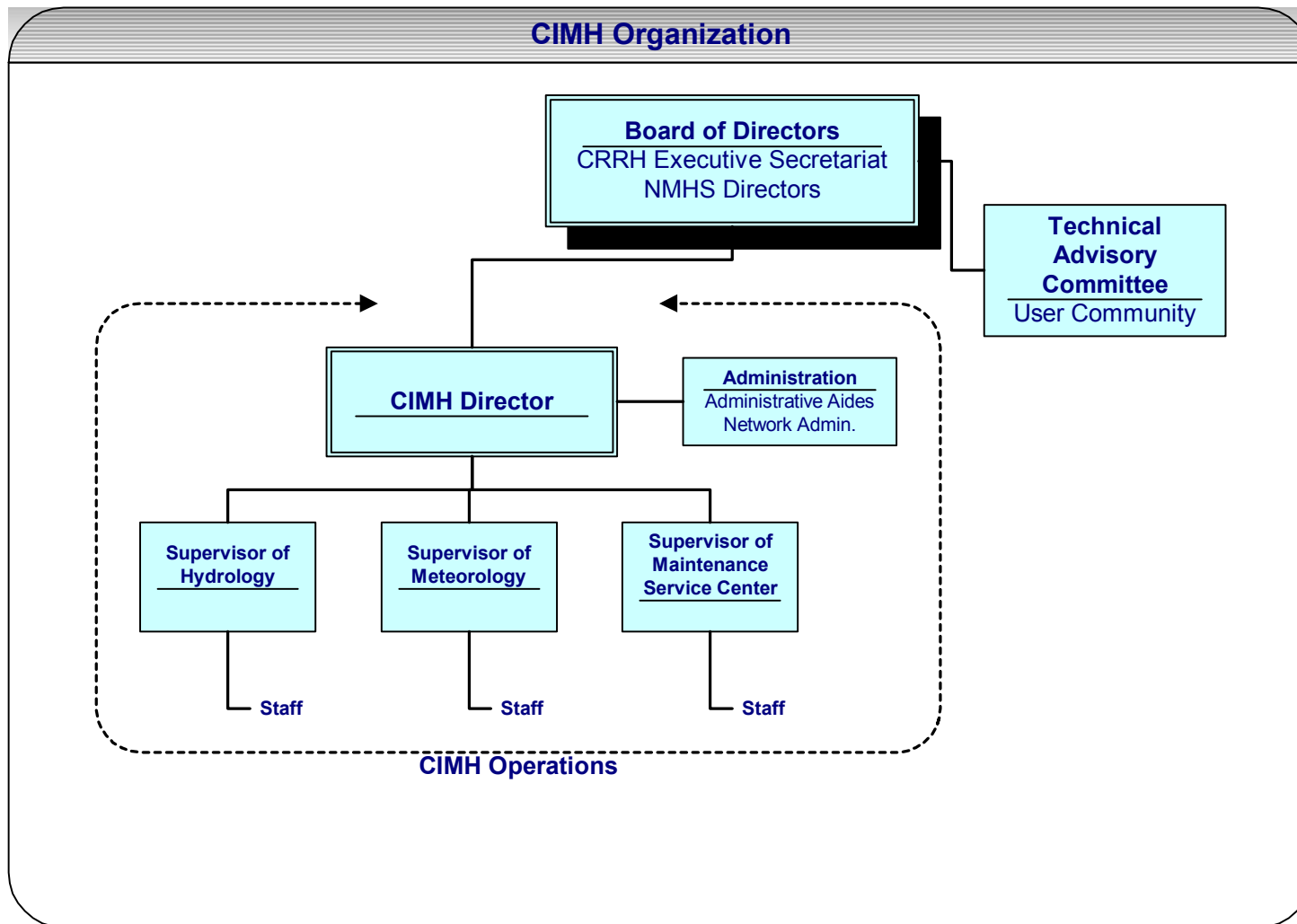
### Administrative Staff

- Administrative aides – 2

Some members of the professional should also have expertise in remote sensing and its applications.

## Organization

The CIMH will be an operational division under CRRH/SICA. Direct oversight will be the responsibility of CRRH. A proposed organization chart follows.





## Chapter VI Implementation, Costs and Sustainability

*Transitioning from the more out-dated manual measurement systems to state-of-the-art automatic systems will place a technical and financial burden on the National Meteorological and Hydrologic Services to sustain the more technically advanced systems.*

# Implementation, Costs and Sustainability

## Implementation

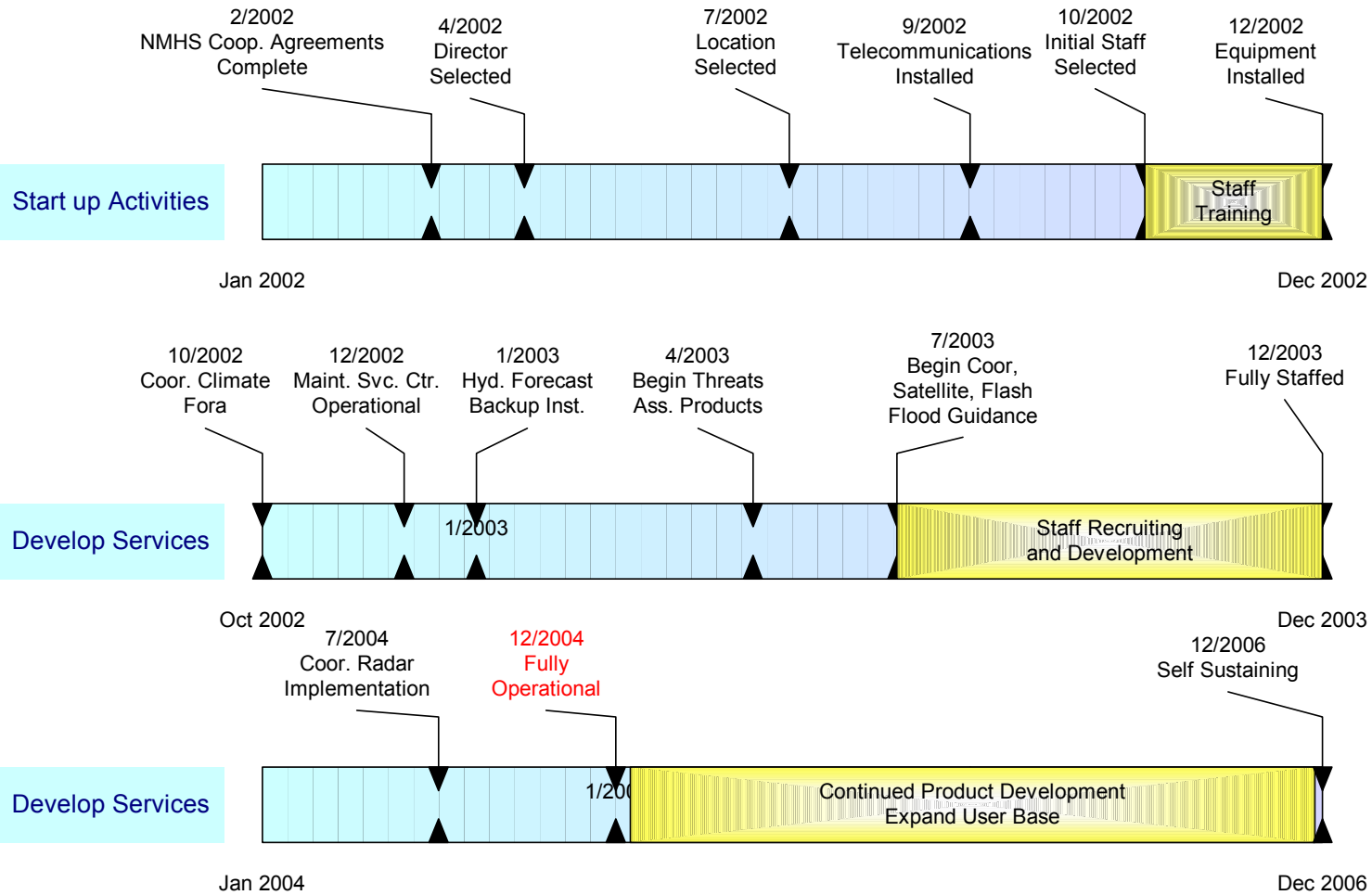
The implementation of the CIMH will be contingent upon initial funding for start-up and future funding sources for operations. Pending funding, some initial implementation activities may be warranted over waiting for complete funding to initiate the CIMH. These initial activities can be oriented toward sustaining the new hardware, software and modeling systems installed as part of the NOAA Hurricane Reconstruction Project, for example.

Some early implementation activities could be as follows:

- At the minimum, funding to hire the CIMH director and to pay for expenses would need to be obtained in order to begin CIMH implementation. The Director can start the integration and coordination process amongst the countries for items such as daily forecast briefings and begin to develop strategies to identify and market users throughout the region. The Director can also develop a detailed implementation plan for the CIMH including the physical design of the Center.
- Through the NOAA Hurricane Reconstruction Project, there already is a regional integration process in place to coordinate the preparation of seasonal precipitation and temperature outlooks. All country NMHSs and universities in the region participate in climate outlook fora on a routine basis to develop composite, seasonal outlooks, especially for the wet season. The Director can continue to coordinate these fora and expand their scope.
- With the installation of state-of-the-art monitoring systems, there is a need to develop a regional approach to maintenance of these systems. A region-wide program that supports national maintenance efforts can provide a cost-effective approach to sustaining these systems that are crucial to early warning programs. This will require the start-up of the Regional Maintenance Center. It is proposed to outsource the start-up and operation of the Maintenance Center to a private contractor for at least the first three years.
- Backup hydrologic forecast systems for critical river basins in the region should be installed since these systems are important for flood forecasting and water resources management.

Proper implementation will require an initial investment of a sufficient amount to develop a viable operation that will attract additional investments and users. ‘Marketing’ of the CIMH to the user community will be continuous beginning with the selection of the Director. A possible five-year implementation schedule is as follows:

### Possible Implementation Timeline (Key Activities)



## Costs

Costs for implementation and operation will vary based on the scope of the CIMH including the level of staffing and the amount of resources provided by each country, especially the host country. For the purposes of this framework, it is assumed that the CIMH will be fully staffed as discussed in Chapter V and that the implementation schedule discussed in the previous section will be followed. It is also assumed that a new building will be constructed. A new building provides the optimum situation of co-locating the CIMH with the Instituto Meteorológico Nacional (IMN) in Costa Rica. It is assumed that the IMN will pay rent to the CIMH for the shared space. It is assumed that the maintenance service center functions will be outsourced to a contractor for the first five years.

Estimated costs for start-up and operations including an estimate by year for a full-scale CIMH are shown in the following table. These values are for planning purposes only; a full-scale business plan is beyond the scope of this document.



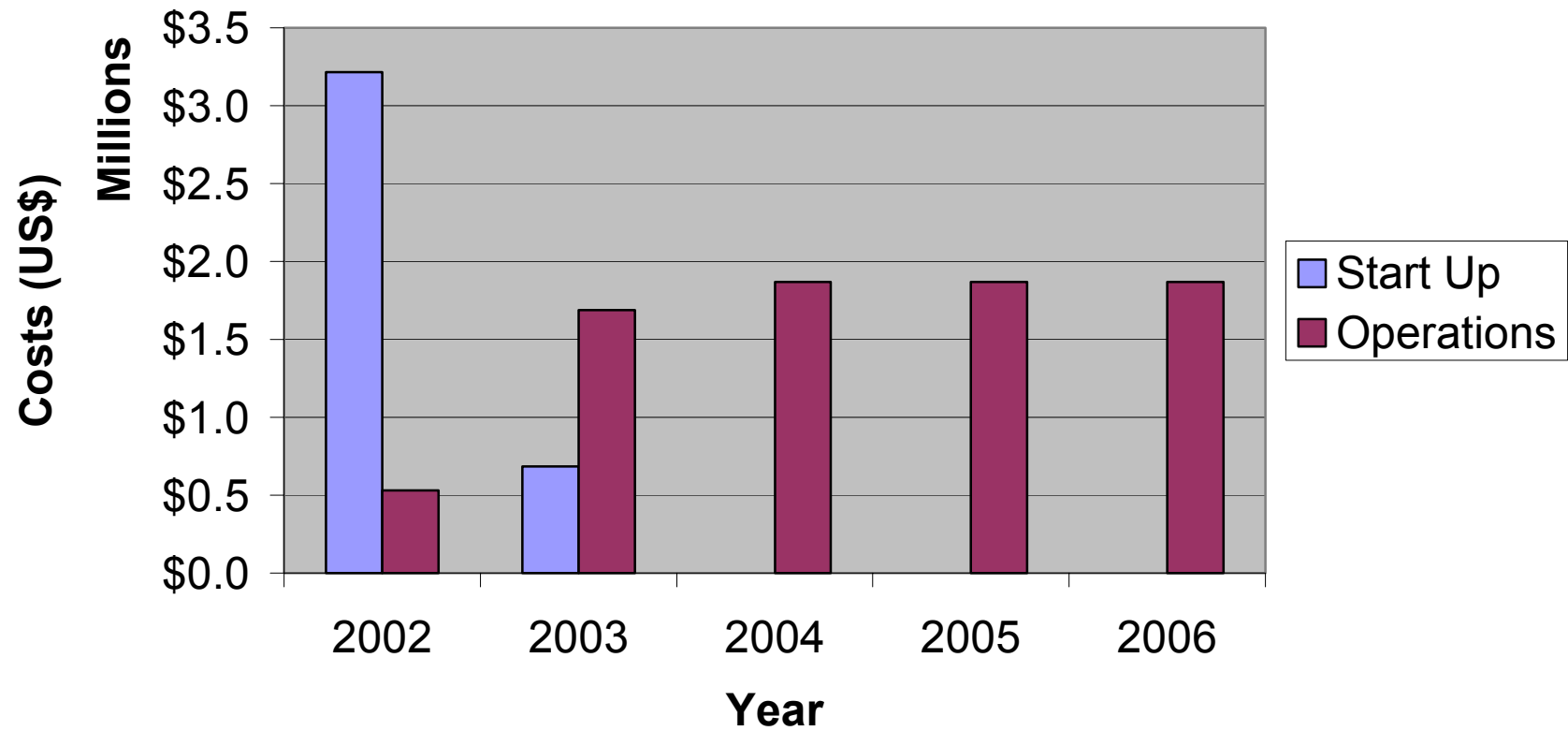
## Estimated CIMH Costs

<i>Cost Item</i>	<i>Cost (US\$)</i>	<i>Comments</i>
<b><i>Start-up Costs</i></b>		
CIMH Building	\$1,800,000	New building, share with IMN (Costa Rica)
Telecommunication Equip.	\$150,000	Telephone system, Internet service, web site development, cell phones
Satellite Ground Station	\$150,000	For satellite telemetered data
Office Computers/Furniture	\$100,000	
Maintenance Fund/Service Center	\$1,000,000	Maintenance Service Center start-up, maintenance trust fund
Communication Equipment – Countries	\$100,000	Internet connections, PCs, software, telephone lines
Recruiting, Miscellaneous Management	\$100,000	Staff recruitment
Weather/Climate Model Development	\$500,000	Provide regional modeling capability
<b><i>Total Start-up Costs</i></b>	<b>\$3,900,000</b>	
<b><i>Operations Costs (Annual)</i></b>		
Telecommunications – CIMH	\$45,000	Telephone, Internet
Telecommunications – Countries	\$198,000	Telephone, Internet
Rent – Countries	\$36,000	Rent for space dedicated for CIMH coordination
Utilities – CIMH	\$12,000	Electricity, water
Utilities – Countries	\$22,000	Electricity
Disposables – CIMH	\$12,000	Office and computer supplies
Disposables – Countries	\$22,000	Office and computer supplies

## Estimated CIMH Costs

<i>Cost Item</i>	<i>Cost (US\$)</i>	<i>Comments</i>
Maintenance Contracts	\$12,000	Computer and other hardware and software
Maintenance Service Center	\$285,000	Spares, calibrations, travel, technicians salaries
Computer Upgrades	\$5,000	PC improvements
Weather/Climate Model Maintenance/Improvement	\$50,000	Meteorological and hydrologic model upgrades
Salary (Director)	\$42,000	
Salaries (Technical Staff)	\$420,000	Does not include Maintenance Service Center
Stipend and Expenses (Board of Directors)	\$20,000	
Salaries – Countries (Technical Staff)	\$696,000	Personnel involved in CIMH coordination activities
<b><i>Total Annual Costs</i></b>	<b>\$1,877,000</b>	

## Estimated Costs by Year



## Sustainability

In order to provide a reasonable probability that the proposed fully operational CIMH can be sustained, funding to support the start-up and operations for at least the first three years should be found. To do this would require approximately US\$8.0M. If a new building is not constructed and space is leased instead, approximately US\$1.6M could be saved over the first three years.

There is no question that the CIMH will need to generate revenue to be able to sustain itself in five years. It is understood that it would not be good practice to continuously rely on grants from countries or institutions to sustain the Center. A private and public user/client base will need to be obtained and specific services and products developed. It is estimated that it will take the first three years at a minimum to develop a user base, develop and deliver products that are useful, needed, and reliable and develop cost recovery mechanisms. The CIMH is not intended to make a profit, just recover costs.

Some considerations for sustainability include the following:

- Have each country provide a quarterly stipend covering an agreed-to percentage of the operating cost of the CIMH. This would be in return for various products and services provided by the CIMH (e.g., satellite imagery, rainfall estimates, flash flood guidance products, climate outlooks, quantitative precipitation forecasts, equipment maintenance support). The stipend could be pro-rated amongst the countries based on needs and requirements (e.g., equipment maintenance needs).
- Have regional users and stakeholders provide funding for operational product development, creation and dissemination (e.g., daily temperature, rainfall forecasts or seasonal outlooks).
- Sell value-added reference products (e.g., climatological summaries, vulnerability assessments, rainfall-frequency analyses) to users. The countries can do this and/or CIMH and the revenues can be shared. Value-added products can also be provided to stakeholders/customers in exchange for services in-kind. The CIMH will not sell raw environmental data but instead will act as a focus for the exchange of these data throughout the region.
- Develop regional marketing programs in conjunction with the countries to develop a user/stakeholder base and to increase CIMH and NMHS visibility and credibility.
- Maintain an active Technical Advisory Committee of users and use that committee to promote the CIMH. Involve meteorological/hydrologic – based organizations such as the Weather Channel – Latin America on the committee. Include political representatives such as environment and finance ministers.
- Work with other Central America Integration System (SICA in Spanish) organizations to improve other sectors affecting the CIMH and NMHSs such as telecommunications.

- Provide services that support the SICA regional proposal for the Transformation and Modernization of Central America in the Twenty-First Century, specifically for projects related to integrated water resources management and reduction of vulnerabilities and impacts of disasters.
- Reduce the size and scope of the CIMH being careful not to reduce or eliminate capabilities that impact the development of future users.



# Appendix

## User Survey